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FOREST RESEARCH NEWS

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FOR THE MIDSOUTH

SOUTHERN FOREST EXPERIMENT STATION, FOREST SERVICE, U. S. DEPARTMENT OF AGRICULTURE

Forest Resources for People Is Concern of 1970 Research

A managed forest is a biological community with a purpose. It contributes to man's well-being through production of goods and services and by providing an esthetically pleasing outlet for his leisure time.

Secretary of Agriculture James Wilson at the birth of the Forest Service in 1905 directed that "all land is to be devoted to the most productive

use for the permanent good of the whole people."

Not long after that, the Forest Service established a research branch to provide basic information for managing and using all of America's forest lands, whether privately or publicly owned.

Growing demands are placed on forest resources, while at the

same time the forest area is shrinking. The Forest Service has researchers with expertise in the diverse disciplines required to meet today's demands.

A brief review of some of the Southern Forest Experiment Station's work in 1970 illustrates the broad concern of Forest Service research and the kind of contribution it is capable of making.





Runoff is measured in Arkansas watershed research aimed at stabilizing stream flow throughout the year.

The Southern Station has more than 100 scientists in laboratories at 12 locations working on essential phases of the environmental problems which must be solved to meet growing demands.

Researchers must understand the characteristics and interrelations of soil, water, vegetation, animal, and amenity resources for each forest and range type. Wilderness protection or timber production cannot be isolated. They are linked with wildlife, water, and recreation. For example, utilization of range lands by wildlife and domestic livestock can have good and bad impacts on water and

esthetics. Research has shown that timber harvesting, grazing, and other manipulative techniques can be used to increase water quantity without deteriorating water quality.

The Nation's growth demands more wood. Research aims at reducing the cost of growing wood, harvesting it, transporting it, and manufacturing it into useful products. Management for timber must always be compatible with both protection and use of other forest resources.

A lot of wood is now economically inaccessible. Harvesting systems are being engineered to bring this material to the Nation's woodpile. Research is seeking ways to use wood more efficiently, particularly in housing and other construction. The Nation's housing goals simply cannot be met unless this research is successful.

MANAGING FOR WATER

Water supplies, so essential to life, industry, recreation, and agriculture, must be increased in water-short areas.





Some forest areas rate as high for recreation potential as they do for timber production.

The Southern Coastal Plain, with but 10 percent of the Nation's land, holds more than 40 percent of the ground-water reserve. Moreover, the region receives 45 to 60 inches of rain a year—enough with careful conservation to replace what is utilized. Studies now in progress determine how forestry practices, such as changing cover types and regulating vegetation density, affect ground-water supply.

In the Arkansas Ozarks, ways are needed to stabilize flow of major streams throughout the year. Heavy thinning of hardwood stands promises to augment stream levels during late summer when flow is down. In the Springfield Plateau, areas where trees were cut had substantially more soil water in the upper 6 feet during this period than in areas where hardwoods were left undisturbed. Thus,

much less precipitation is needed to recharge the soil, and more rainfall reaches the streams. Heavy thinning appears to increase delivery of water by several area-inches annually. Water-based recreational enterprises and down-stream municipalities and industries benefit from this practice. Recent inventory-analysis of the forest resource in Arkansas indicates that portions of the State rate as high for recreation potential as they do for timber production.

Although controlled burning is useful in several phases of forest land management in the South, research results suggest that stand conversion procedures which include fire should be used with caution in hilly sections of the upper Coastal Plain. Experiments on erosive sites have shown that a single prescribed fire can appreciably accelerate erosion. When aban-

doned fields were burned prior to planting pine trees, sediment loss increased by up to 3 tons per acre annually. Moreover, protective cover was not restored to preburning levels after 3 years of growth. Prescribed fire associated with converting low-grade hardwoods to pines also increased soil losses. Although the sediment yield decreased during the second and third years following the fire, the increased runoff persisted.

FASTER FORESTS

Growing more and better trees requires research attacks from several directions.

Direct seeding, a technique for broadcasting pine seeds from an aircraft or ground-operated machine, has been a giant stride forward in bringing the South back from forest famine to forest bounty. The method became



Tubelings extend the planting season to 10 months.

random pattern rather than in rows. So the Southern Station is sponsoring research at Auburn University, Alabama, to develop a prototype seeder which sows in rows. With it, landowners will be able to reforest up to 500 acres a day from a single aircraft. By contrast, 10 or 15 acres daily is the quota for a planting machine.

Planting 6-week-old "tubelings"—container-grown seedlings in paper tubes about an inch in diameter and 8 inches long—apparently lengthens the planting season for southern pine. This is welcome news to foresters and landowners who have a problem getting enough labor to plant required acreage with nursery-grown seedlings during the short, traditional planting season. The "tubelings" survive harsh summer weather about as well as seedlings grown in a nursery for almost a year and can be planted all year except in July and August.

New hope for reforestation with longleaf pine, once called the "queen of southern pines," is seen with a discovery at the Southern Station's Alexandria Forestry Center. Scientists there have established that longleaf pine trees can be bred with built-in resistance to damaging brown-spot needle blight. This is good news in the search for ways to produce fast-growing, disease-free forests in which pests are checked without harm to natural environment.

Longleaf has gradually fallen into disfavor, largely because the needle blight prevents it from making height growth in its early years. But about 50 disease-resistant trees have been located across the South and strains developed that are almost immune to damaging brown-spot. The genetic material is being preserved in a clonal orchard near Alexandria. If such trees can be made available in quantity, there will no longer be a need to spray with

Scrubby longleaf pine seedlings from nonresistant parents can hardly be found in the grass at the left, while those from parents resistant to brown-spot needle blight are flourishing. All seedlings are 3 years old.

feasible only after Southern Station scientists developed a chemical coating for seeds to discourage birds, rodents, and insects from eating them. Last winter Louisiana landowners sowed about 23,000 acres—approximately 40 percent of the total acreage reforested in the State in 1970. Southwide, about 1.5 million acres have been direct-seeded since the method was perfected.

An objection to aerial seeding has been that trees grow in a



fungicide in nurseries. Prescribed burns for control of brown-spot in the forest will be unnecessary. And the fast growth of resistant trees will shorten time needed to regrow longleaf pine forests.

Striking gains in loblolly and longleaf performance are possible by selecting seeds from specific localities. This fact is revealed by an analysis of 10- and 15-year data in a southwide study of pine tree seed sources. For instance, loblolly seeds from Livingston Parish, Louisiana, combine fast growth and good resistance to fusiform rust when planted in central and southern parts of Mississippi, Alabama, and Georgia, and in northwest Florida and southeastern Alabama. Southeast Texas provides the best seed for loblolly pines in Texas, western Louisiana, and southwestern Arkansas.

Starting new forests, or speeding the growth of established stands, requires control of brush and weed trees. For spraying hardwood brush, 15 alternative formulations have been found as effective as the controversial 2,4,5-T ester. Most of the formulations are damaging to pine, however, and search is continuing for chemicals whose effects are restricted to the plants that must be controlled—and which can therefore be used in minimum quantities.

COTTONWOODS CAN

Cottonwood plantations offer land managers and forest industries an excellent way to reverse the decline in forest resources in the Mississippi Delta. The area has been generally regarded as the most productive hard-



Remarkably fast growth of planted cottonwoods is shown on section from 5-year-old tree.

wood land of any size in the Nation. But extensive land clearing has caused widespread concern over the future of the Delta's hardwoods.

Improved clones capable of very fast growth have been developed through research at the Southern Hardwoods Laboratory at Stoneville, Mississippi. They will be made available to State nurseries in the winter of 1971-72.

Techniques for commercial planting and cultivation of cottonwood to assure high survival and good growth have been perfected. High yields can be obtained through a combination of careful site selection, site preparation, cultivation during the first year, and protection from insects. During their first year the trees also need protection from deer and other grazing animals.

Southern Station researchers' appraisal of the economics of

growing cottonwood indicates that although initial investments for land clearing, planting, and cultivation are high, rapid growth of cottonwood permits rates of return up to 16 percent on the best sites. The wood is utilized for furniture, magazine papers, particle board, insulation board, architectural trim, boxes, crates, and many other products.

ENVIRONMENTALLY SAFE PEST CONTROL

More trees are damaged by forest insects and diseases than by fire.

In all disease and insect research, the aim is controls that will have the least adverse effects on the environment.

Supporting geneticists' efforts to develop disease-resistant trees, researchers at Gulfport, Mississippi, are seeking to determine the extent of pathogenic

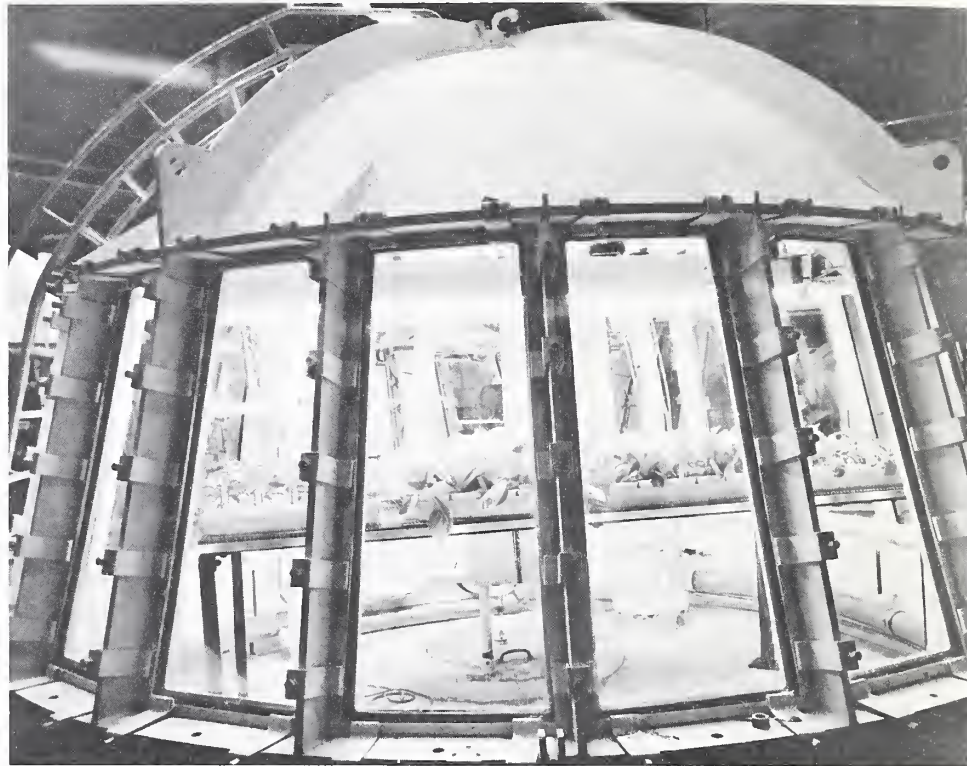
SKY GARDENING

variation in fusiform rust, perhaps the most destructive disease of southern pine forests. Initial results show that isolates from several geographic areas differ in their capacity to infect resistant selections of slash pine. For example, slash pine progeny regarded as resistant to the disease in Mississippi were found to be resistant to rust isolates from Mississippi and Texas, but highly susceptible to those from Florida and Alabama. A thorough understanding of the variability in this fungus is expected to speed development of trees with long-lasting resistance.

The forest tent caterpillar defoliated 45,000 acres of water tupelo in southwest Alabama and 450,000 acres in south Louisiana in 1970. Research on its control demonstrated this year that aurally applied ultra-low-volume, nonpersistent materials are effective. The carefully controlled tests utilized new organophosphates and carbamates that are of low toxicity and quickly break down to substances which do not pollute the environment. Tests were in cooperation with wildlife and conservation agencies, and no evidence of damage has been reported.

Determining that no pathogens harmful to earth's plants were brought back from the moon by Apollo astronauts has been the responsibility of a unique, germ-free laboratory administered by a Forest Service scientist. The laboratory is at NASA's Manned Spacecraft Center at Houston, Texas.

From tests on a wide assortment of plants, it appears that moon soil actually helps growth of some plant species. Research continues to find why this is so.



Cabbages, peppers, radishes, and lettuce grow in an atmosphere simulated for Skylab, an orbital workshop planned for future launching. Pine trees also will be tested.



Radishes, 10 days old, germinated and growing in the simulated atmosphere of Skylab.

Seeds of cabbages, peppers, lettuce, and radishes are now being germinated in a simulated environment acceptable for future orbital workshops. As a part of the NASA-Forest Service cooperative program, USDA scientists will determine whether or not it is feasible to grow plants aboard manned spacecraft such as Skylab, planned for launching in late 1972. Pine tree seeds also will be tested for their adaptability to Skylab environment.

WOOD + WATER = WILDLIFE

Where wood and water abound, wildlife seems to flourish.

White-tailed deer were nearly exterminated in the South by 1920. But they have increased

by eight times since the mid-1940's and are more numerous now than at any time since early settlers came to this country.

Growth in deer population closely parallels favorable forestry practices. Food yields, and thus deer populations, are governed by timber stand density, frequency of timber cuttings, size and distribution of cutting units, and application of prescribed burning.

Now researchers develop and test ways to produce more wildlife food just as they learn to produce more wood. They know what a deer's diet consists of and what plants to grow for deer and other game population.

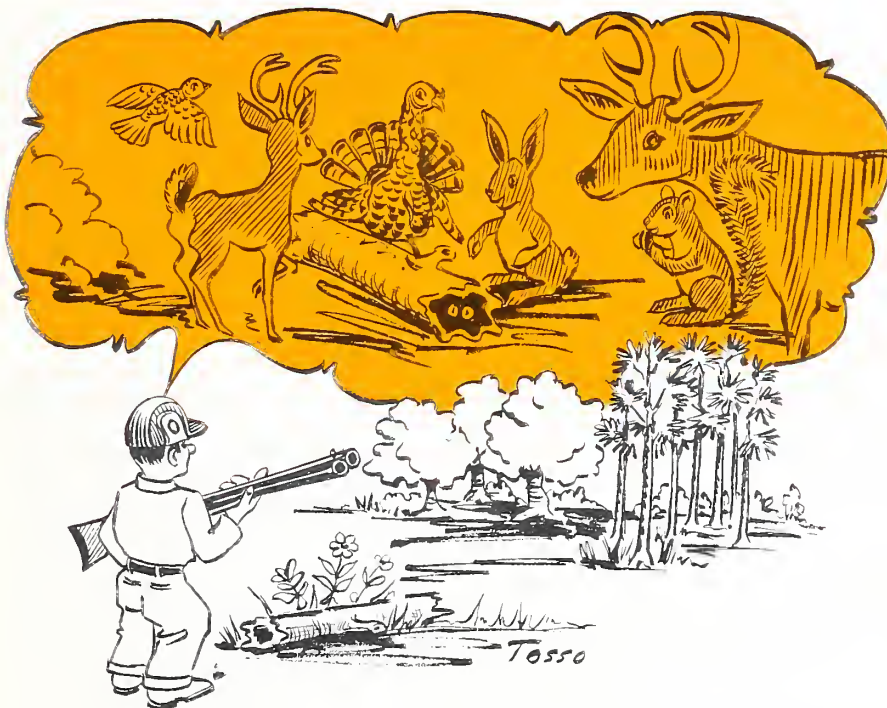
Although deer populations in southern forests have increased dramatically in the past 10 to 20 years, few ranges support deer in numbers near those of



which they are potentially capable. Much of the habitat research at Nacogdoches, Texas, is directed at identifying the causes of this deficiency.

Study shows that in many cases overstory is too dense to permit growth of food plants. Thinning the trees at 5-year intervals increases the food supply, but doesn't completely solve the problem. Many browse plants are low in food value during the winter, and those growing under trees are generally less nutritious than those in the open. Experiments show that native species vary considerably in food value, and management to favor selected shrubs and vines can materially benefit deer.

Three common species—Japanese honeysuckle, Alabama supplejack, and rusty blackhaw—have been found to be as nutritious when grown under trees



as in the open. Thus, these food plants have special value for improving the wildlife habitat in forests.

On cutover longleaf pine-lands in southern Alabama researchers found a combination of disking, fertilizing, and seeding best for establishing the partridge-pea and common lespedeza. However, the number of plants and seed pods declined so rapidly after the first year that seeding these legumes to increase the food supply for game birds is probably not practical.

USING THE WHOLE TREE

A huge increase in the demand for forest products is a certainty, and the South's share of that market could easily exceed three times its present volume, according to Southern Station economists.

Southern pines comprise the primary softwood timber species in the United States, and their relative importance is growing. It is estimated that by the year 2000, 51 percent of the softwood used in this country will come from the South.

Housing is the number one market for softwood lumber. It takes 40 percent of the Nation's production. Southern pineries furnish about 15 percent of the softwood plywood used in the United States, 23 percent of the particleboard, 25 percent of the softwood lumber, 36 percent of the fiberboard, almost 40 percent of the market dissolving pulp, 41 percent of the groundwood pulp, a major share of the kraft pulp, more than 75 percent of the poles, and nearly 100 percent of the turpentine and rosin.

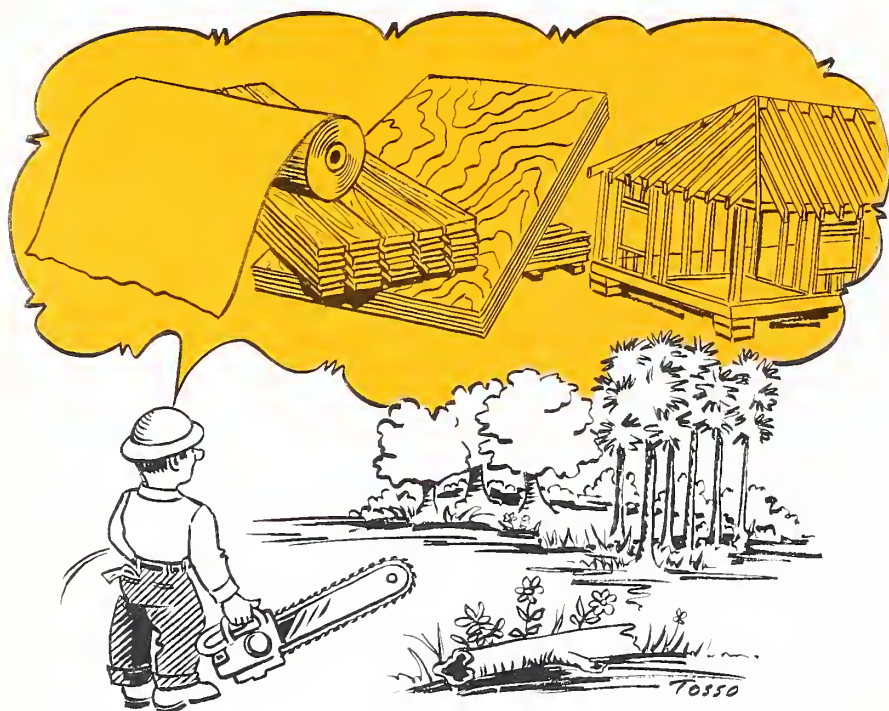
Some of the commodities are also important in international

markets. In 1968 the kraft mills of the South produced approximately 25 percent of the total pulps and 45 percent of the kraft pulps required in the world. Southern pines provided wood for about 77 percent of this pulp. They additionally supply about one-half of the world's naval stores and three-fourths of the crude tall oil produced outside the Sino-Soviet bloc.

In the South—not including the mid-Atlantic or Central States of Delaware, Maryland, West Virginia, and Kentucky—the timber-based industry in 1958 employed about 1 million people and added over \$6 billion to the gross national product. Economic importance of the industry is increasing. In 1969 it was estimated that through production and distribution of wood products the 12 Southern States contributed \$4 billion to the economy of the North, while adding \$10 billion to the economy of the South.

Forest economists predict the South's output of plywood will reach 6 billion square feet by the middle 1970's, possibly rising to 8 billion square feet later in the decade. By 1980, they predict the South will be pulping 60 or 65 million cords of all kinds of wood, including residues—a 50 percent increase over 1970.

There are good reasons why southern pines are preeminent as a source of raw material for industry, according to Station researchers. Substantial volumes of timber are available now, and the resource is rapidly renewable. The trees can be grown economically on a short rotation over a broad range of sites. Technologies for regenerating and managing the stands are highly developed.





Adequate housing is a prime environmental necessity.

Geography favors growth, utilization, and marketing, and the wood itself has an unusual combination of desirable properties.

Total utilization of the tree—roots, stem, bark, and foliage—while avoiding waste, is a primary aim of scientists at the Alexandria Forestry Center. Their research contributed heavily to development of the chipping headrig, a device that squares logs without making low-value sawdust. With this machine,

widely adopted throughout this country and abroad, less than 5 percent log volume is converted to sawdust instead of 25 percent as formerly. Because of their ability to convert small logs into lumber at high speed and without waste, chipping headrigs have greatly increased fiber recovery from southern forests.

Bark accounts for at least 10 percent of the total weight of the tree stem. It accumulates at wood-using plants in huge quantities, and most of it is in-

cinerated. Roots, which may account for another 10 percent of the total tree weight, are also wasted. And a pine tree may produce approximately as much weight in needles each year as in wood.

Initial studies indicate that up to 25 percent of the fiber put into particleboard can be bark. Further, bark might serve as a good fuel for electrical generating plants, which are on the verge of a huge expansion in the South.

The harvest of green southern pine bark will likely exceed 20 million tons annually by the year 2000. This is sufficient to fuel 12 generating plants, each with a capacity of 1 million pounds of steam per hour (1,000° F.). In total, these 12 plants could supply present electrical needs of the cities of Savannah, Mobile, and Pensacola. Avoiding atmospheric pollution is a requirement of any method of using bark. Fortunately for prospective users, bark contains little or no sulfur—one of the chief culprits in air pollution from combustion of fuels.

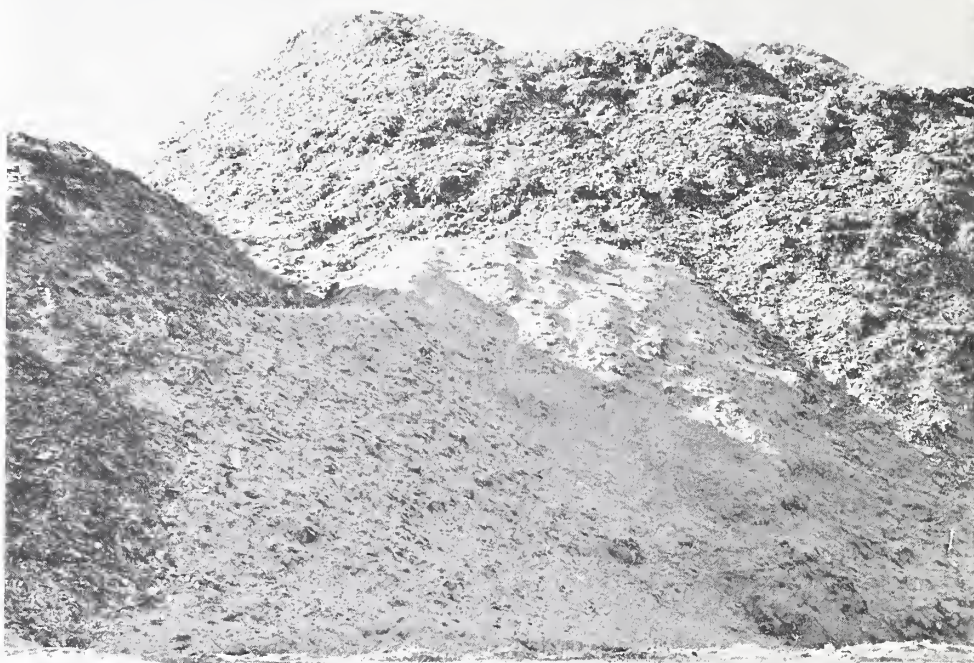
Studies are also being made of the cellular structure of pine roots to determine what use might be made of this material.

In 1970 a new method for kiln drying southern pine studs was developed. The new process takes only one-fourth the time and half the energy required by older systems. Moreover, the studs are straighter and therefore of higher value.

Experiments show that heavily pigmented stains, if properly applied to suitably prepared rough southern pine siding, will give excellent service in southern climates.

Basic research on the mechanical pulping of southern pine wood indicates that it may be possible to greatly reduce the amount of wood required to make a ton of paper.

Past research on gluing has yielded data of value to the southern pine plywood industry and has produced a design for laminated beams of exceptional strength. The work continues with the intention of finding glues that will be cheaper and stronger than those now in use.



Bark accumulates in vast quantities at wood-using plants. How can it be used?

FORESTS FOR ALL AMERICANS

To bring knowledge of the forest resource to all segments of the population is the purpose underlying establishment of a preforestry training program at Tuskegee Institute in Alabama. Created through the Institute's cooperation with the USDA Forest Service, the University of Michigan, and the University of California at Berkeley, the program is the first of its kind in a traditionally black college. An objective is to interest black students in forestry studies.

In addition, research on factors influencing dormancy in tree seeds and on the relationship between the soil nutrients and juvenile growth of longleaf pine is being conducted cooper-

atively by the Institute and the Southern Station.

Forest land owned by the Institute and located nearby affords opportunities for outdoor laboratories in teaching, research, and demonstration. Also, good management practices on Tuskegee land will provide a model for owners of similar tracts throughout the South.

Because Negroes make less recreational use of the forest than their white counterparts, and benefit less from forest land income, the Southern Station has created a research project aimed at deriving information to remedy the situation. The project seeks ways to enhance recreational and economic forest opportunities for black residents of the rural South.



